

University of Bahrain
College of Information Technology
Department of Computer Engineering

ITCE 341: Introduction to Microprocessors
Test1: Semester 2, 2008-2009

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Date: April 15, 2009	Student Name:
Time: 1 Hour	Student ID No:
Section No:	Department:

Make sure you have 6 pages with 5 questions

Question	Points	Grades
Question1	5 + 5	
Question 2	9 + 9 + 9	
Question 3	7 + 7 + 7	
Question 4	18	
Question 5	8 + 8 + 6	
Total		

Notes:

- 1. Cellular Phone is not allowed**
- 2. Answer should be in ball pen**
- 3. Follow instruction when answering each questions**

Q1- Assume we have microprocessor that has an 8-bit wide INSTRUCTION POINTER register (or program counter register). The microprocessor has an instruction format that is OPCODE|DATA, where the OPCODE field is 5 bits, and the DATA FIELD is 8 bits.

a. What is the maximum number of different types of instructions that this processor could support?

OPCODE field = 5 bits, $2^5 = 32$ maximum different instruction types

b. What is the largest program (number of instructions in the program) that this processor could have?

Instruction pointer width = 8bits, $2^8 = 256$ instructions in program

Q2-Assume the memory contents of the code segment from address 09A0:0000 to 09A0:003F are as shown in the following table:

ADDRESS	CONTENTS															
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
09A0:0000	C5	67	A5	00	12	BC	34	BB	F4	72	09	A3	29	01	D4	CE
09A0:0010	FE	89	02	D8	A4	8A	7C	DD	90	3C	9B	83	66	19	F6	8A
09A0:0020	A7	CC	9A	BD	8E	90	2C	00	1C	90	0E	13	8C	39	58	9E
09A0:0030	76	D7	CA	FF	D8	71	18	24	40	A8	2C	76	93	C5	0F	86

Assume the following register contents:

DS: 09A3, SS: 09A1, BX= 000C, BP:0004

Give the final value of the affected register, Physical address and assemble the instruction statement:

A) mov DL,CS: [BX]

- Physical Address: $DS*10+BX = 09A00+000C=09A0C$
- AL: 29
- Assembled: 00101110 10001010 00010111 = 2E 8A 17

B) mov AX, [BX-5]

- Physical Address: $DS*10+(BX-5) = 09A30+0007= 09A37$
- AX: 4024
- Assembled: 10001011 01000111 FB = 8B 47 FB

C) mov CX, [BP+8]

- Physical Address: $SS*10+(BP+8)= 09A10+(0004+0008) = 09A1C$
- CX: 1966
- Assembled: 10001011 01001110 08 = 8B 4E 08

Q3- Mark each of the branches in the following code sequences as Taken or Not Taken, as well as, determine the values of the given flag register assuming the following register contents.

CS: 0BC5, DS: 0BC4 SS: 0BC6, AX = 8391 BX :0028 , CX = 9040 DX = 85A3
BP: 0051, SP= 005E

a)

and cl, 0Fh

jz THERE

TAKEN

NOT TAKEN

CF= 0

SF= 0

OF= 0

ZF= 1

b)

cmp bl, al

ja THERE

TAKEN

NOT TAKEN

CF= 1

SF=1

OF= 1

ZF= 0

c)

cmp bl, al

jg THERE

TAKEN

NOT TAKEN

CF= 1

SF=1

OF= 1

ZF= 0

Q4) Assuming the LSB (rightmost) is numbered as b0, and the MSB (leftmost) is numbered as b7, let AL = b7b6b5b4b3b2b1b0 . Write an instruction sequence of no more than 4 instructions that will leave the new value of AL as : 100000b5b4 .

one possible solution:

shr al,4 ; move bit5,b4 to lower 2 bits (0000 b7b6b5b4)

and al,3 ; mask upper 6 bits to zero (000000 b5b4)

or al,80h ; set MSB = 1. (100000 b5b4)

Q5) For the given loop, answer the following:

```
                xor    al, al
NEXT:           inc    al
                jnz    NEXT
HERE           ....
```

a) Total number of loop iterations: **255 iteration**

b) Total Loop Cycles: **255 Iteration * (2+8+8)** $\frac{\text{Cycle}}{\text{Iteration}}$

c) if frequency is 10Mhz, what is the total delay time: **255*18*100ns**

d) Present the code sequence of the above code using “loop” instruction, you may add an additional instruction if you needed.

```
                MOV    CX,00FF
NEXT:           loop NEXT
HERE           ....
```